

Cyclotron

NSD 88-Inch Cyclotron

Procedure

Title:		TRENCH SEARCH AND SECURE PROCEDURE	
Procedure Number:	Revision:	Revision Date:	Page
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1.0 PURPOSE

In general the search and secure (SAS) procedure is to have a searcher methodically search the Trench to look for people, hazardous conditions and to check the operational readiness of equipment. Once the searcher has verified that the Trench is ready for operation, then the searcher will secure the Trench to prevent anyone from reentering the Trench.

The intent of this procedure is to ensure that, when the Cyclotron and/or its Radio Frequency System (RF System) are operating, the Cyclotron staff and visitors are excluded from the Trench, thereby protecting them from prompt radiation.

The scope of this procedure includes having the searcher physically closing the Trench, searching the Trench to ensure no one remains in the Trench, and inspecting the Trench to ensure it is ready for safe Cyclotron operation, and then the searcher leaves and secures the Trench, and finally the searcher logs the result of the search in the Cyclotron Operation Logbook in the Control Room.

If the Operator in Charge (OIC) has any doubt about the presence of people in the Trench, the OIC **must** SAS the Trench before operating the Cyclotron or RF system.

2.0 QUALIFICATION

This procedure is performed by a trained person familiar with the normal Cyclotron operational practices and the normal configurations of the Cyclotron equipment.

This procedure is to be performed by a qualified radiation worker or Cyclotron Operator (a second radiation worker, operator, or a trainee, may accompany the qualified worker for safety or training purposes only.) Only people trained in this procedure may search and secure the Trench.

This procedure may be performed by the persons who have completed NSD1006 "Trench Search and Secure Procedure" training. The EH&S Training Reports database may be checked to find the names of the persons that have completed the required training for this procedure.

3.0 HAZARD REVIEW

The performance of this procedure should not subject personnel to increased hazards above

those associated with entering a controlled area. Upon entering controlled areas the searcher must follow the established facility safety practices.

4.0 PROCEDURE

4.1 Search and Secure Preparation:

4.1.1. Verify the Trench area is ready to be secured and all work in the Trench area has been completed.

4.1.2. Secure or verify the Cyclotron operation has been secured by having the OIC open the 12kV breaker.

4.1.3. Verify that the Cyclotron Radiation Safety Interlock System chain has control power at Interlock Panel A2111. It is essential that the lamp labeled SAFETY CHAIN control power be on to provide control power to enable completing the Trench search and secure procedure.

4.1.4. Prepare a Trench SAS checklist. The searcher will use the SAS checklist as an aide to the performance of the procedure. Complete the checklist as the procedure is performed and insert the completed checklist in the Cyclotron Operations Logbook. A Trench SAS checklist is shown in Attachment A.

4.1.5. Take a TRENCH key from the CONTROL ROOM TRANSFER KEYS panel in the Control Room.

4.2 Search and Secure the Trench:

To search and secure the Trench, proceed as follows:

4.2.1. Enter the Trench: At the west Trench door, open the Trench door using the Trench key.

4.2.1.1. Enter the Trench through the open west Trench door, and close it after you enter.

4.2.1.2. Proceed through the Trench to the east end of the Trench.

4.2.2. Search the Trench: Search to the east end of the Trench. As you move, search for any people remaining in the Trench. People could

be working well out of site. Ask all personnel to leave the Trench. If anyone is found in the Trench, the search must start over, return to section 4.2, after they have left and the gate is again closed.

4.2.2.1. Search for any unsafe condition that exists or that could impair the safe and proper operation of the Cyclotron. Correct any safety concerns or operational readiness concerns found. The search must start over after the problems have been corrected. Return to section 4.2.1.

4.2.2.2. Check that Cave 1 floor hatch is closed and fully seated.

4.2.2.3. Check that the Cave 2 floor hatch is closed and fully seated.

4.2.2.4. Check that the Cave 3 floor hatch is closed and fully seated.

4.2.2.5. Check that the Cave 5 floor hatch is closed and fully seated.

NOTE

Note that the Trench does *not* go under Cave 4 and there is no Cave 4 floor hatch into the Trench.

4.2.2.6. Search the cross trench to the Cyclotron Pit access tunnel (blocked by screen and cable trays) and return to the main Trench.

4.2.3. Secure the Trench: At each of the three Trench INSPECTION RESET switch boxes:

A) Check that each RUN-SAFE switch is set to RUN;

B) Check that each amber beehive light glows, Replace defective lamps as they are found (the RUN-SAFE switch must be in RUN mode), begin the SAS if interrupted by defective parts replacement;

C) Press the TRENCH INSPECTION REPORT switch lamp; check that the lamp glows;

4.2.3.1. Move to the HATCHES INSPECTION RESET switch box, (just inside the Trench door)

perform the above checks and press the lamp switch.

4.2.3.2. Move out through the Trench door, closing it behind you, and locking the deadbolt lock.

4.2.3.3. At the outer TRENCH DOOR INSPECTION RESET switch box, (just outside the Trench Gate): perform the above checks and press the lamp switch.

4.2.3.4. At the outer REDUNDANT TRENCH DOOR AND HATCHES RESET BOX, (next to TRENCH DOOR INSPECTION RESET switch box): perform the above checks and press the lamp switch.

4.2.3.5. Return to the Control Room with the Trench key and insert the Trench key into the TRENCH key switch at rack panel, and turn it fully cw.

4.2.3.6. Check that the Interlock Chain lamps labeled TRENCH: DOOR, RESETS, HATCH glows and that the Redundant Interlock Chain lamp labeled TRENCH, DOORS & HATCHES glows.

4.2.3.7. Record the time that the Trench SAS was completed and sign the entry in the Cyclotron Operation Logbook. This completes the trench search.

NOTE

If anyone must enter the Trench, the OIC **must** ensure that everyone entering the Trench actually leaves the Trench. If the OIC has any doubt about the presence of people in the Trench, then the OIC **must** search and secure the Trench before operating the Cyclotron.

5.0 RECORDS

Records generated by compliance with this procedure are to be in compliance with RPM, Section 1.18, Records Management. Records generated through implementation of this procedure consist of the entry in the Cyclotron Operations Logbook indicating the signature of the searcher and the time of the completion of the SAS. In addition the completed SAS checklist is

kept in the Cyclotron Operations Logbook. The Cyclotron Operations Logbook is maintained in the control room by the Operations Supervisor.

6.0 REVIEW OF PROCEDURE

Under the guidelines for DOE Order 420.2B, this procedure will be reviewed at least once every three years, or sooner if changes occur that may impact the appropriateness or implementation of this procedure.

REVISION HISTORY

24 September 1996: General review of older Procedure 88-10-01 dated 5/20/91. Updated and approved as V 1.0 due to engineering changes in the Pit Search and Secure chain, and the addition of the redundant interlock chain in the Pit.

1 June 2006: 88-PRO-006 was updated and approved as V 2.0 to reflect current operating practices and implementation.

7.0 GLOSSARY

ALARA Policy: The LBL ALARA (As-Low-As Reasonably-Achievable) Policy for personal radiation exposure. For the Laboratory ALARA policy see LBL Publication 3000 Section 21.3: ALARA Program at Berkeley Lab.

SAFETY CHAIN INTERLOCK PANEL: The Cyclotron Radiation Safety Chain Interlock Panel located in the Control Room at rack A2111.

OIC: Operator-in-Charge

RF SYSTEM: The Radio Frequency System, the source of energy used to accelerate the ion beam inside the Cyclotron. RF energy creates the voltage on the dee electrode that accelerates injected ions and may accelerate stray ions (dark currents).

SEARCHER: A person qualified to execute this Procedure, usually the Cyclotron Operator in Charge or another qualified Cyclotron staff member, who will clear, search, and secure the Cyclotron Trench and record the fact in the Operation Logbook.

TRENCH INSPECTION RESET SWITCH BOX:

These are inspection boxes that have a RUN-SAFE switch, an Amber globe light and an Inspection Report pushbutton lamp switch. There are three of these boxes, one inside the Trench door and two just outside of the Trench door. If the lamp switch fails to glow when pushed there is probably a floor hatch improperly seated or someone has moved one of the cave hatches and opened the micro switches under the hatch or the break is an open RUN-SAFE switch. The problem must be corrected. Once corrected clear the Trench and begin the SAS again.

8.0 REFERENCES

1. LBNL Publication 3000, **Health and Safety Manual**, Chapter 21, Section D (2), *Entry Control Program*.
2. LBNL Publication 3000, **Health and Safety Manual**, Chapter 21.3, *ALARA Policy at Lawrence Berkeley Lab*.
3. LBNL Drawing 8W6365, the *Radiation Safety Interlock Chain* overall schematic diagram.
4. LBNL Drawing 22W 3214, *Cave Hatch And Trench Personnel Protection System* overall schematic diagram.
5. DOE Order: DOE O 420.2B, *Safety of Accelerator Facilities*

9.0 ATTACHMENT

Attachment A. Trench Search and Secure Checklist. Changes to the checklist do not warrant a revision of the procedure.

Attachment A

Trench Search and Secure Checklist

Initial what was completed. ND- Not Done NA- Not Applicable

Page _____

Search and Secure Checklist											Date: _____		
Preparation	Vault	Pit	Tren	01/02	1	2	3	4	4A	4B	4C		
Ask all personnel to leave the area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Search	Vault	Pit	Tren	01/02	1	2	3	4	4A	4B	4C		
Enter area closing chain protected doors / gates behind you	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Search and ensure all people are out of the area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Proceed around the area, press chain inspection lights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Verify primary (up) & secondary (dn) inspection lights on	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Verify all area doors, hatches and gates are shut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Verify "Run-Safe" switches are in the "Run" position	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Verify Amber beehive & emergency door open button glows	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Search the area for any unsafe conditions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Search for any condition that will preclude safe operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Verify beam plug shielding is adequate & undisturbed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Verify shielding bricks are in place in the escape ways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Ask experimenter about any temporary shielding.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Verify beamline devices are working	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Resolve any problems encountered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
After problems are resolved begin SAS again	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Secure	Vault	Pit	Tren	01/02	1	2	3	4	4A	4B	4C		
Exit area and close doors / gates behind you	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Return door key to control room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Record	Vault	Pit	Tren	01/02	1	2	3	4	4A	4B	4C		
Record SAS and sign entry in Control Room log book	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		